Mathematics Grade 8

Mathematics is used as a means to communicate about quantities, logical relationships, and unknowns. Such a simplistic statement may make students who are not planning to go to college ask why mathematics is necessary for them. While the ability to do computation is important, it is the skills of problem finding and problem solving along with developing abstract thinking, symbolic representation and interpretation, logical arguments, and objective reasoning that allow us to function effectively and understand our world.

Mathematics is the one area of coursework in the school curriculum where students are taught these skills, and where answers cannot be obtained just by common sense and guessing. Even without an ever-increasing reliance on technology, mathematical skills meet needs for practical everyday life, intelligent citizenship, and future employment. A study by Arizona State University indicated that students who opt out of advanced levels of mathematics and science may now eliminate up to 75% of career opportunities from which to choose[†]. Algebra has been called the academic passport for passage into virtually every facet of the job market. Employers want their employees to be able to set up problems, estimate solutions, identify how accurate solutions need to be, work with other people to reach goals, know the many different types of mathematics that exist, and determine which one is needed in a particular situation. It is clear that the mathematical literacy of the twentieth century will **not** be sufficient for the twenty-first century.

[†]*ASU Research* Fall 1998, p. 41

About the Test

The AIMS DPA Mathematics test contains approximately 80 multiple-choice questions. Fifty-five of the items are AIMS questions. Fifteen items are *TerraNova* and AIMS questions, and 10 items are *TerraNova* questions. Calculators are not allowed; however, the calculations required can be readily handled with pencil and paper. The questions will emphasize conceptual understanding, process, and problem -solving skills rather than just computation skills.

Hints for Taking AIMS Mathematics

- Remember, this is not a timed test. Take your time and do your best work.
- Check to see if your answer is reasonable.
- Since calculators are not allowed on this test, double check your work!

Sample Questions for Mathematics

What To Expect From This Section

This AIMS DPA Student Guide for Mathematics provides examples of the format and types of questions that will appear on AIMS DPA Mathematics. An attempt has been made to provide a sampling of the types of questions that might be asked; however, not every concept in each strand has a corresponding sample question in this guide. An answer key for all mathematics sample questions is provided in the appendices. Additionally, you will find an AIMS DPA Mathematics Reference Sheet in the appendices. The reference sheet in the actual AIMS DPA Mathematics test will be revised to reflect the formulas and other information that will be included on the test.

Strand 1: Number Sense and Operations

General concepts you should know:

- Real number system and its various subsystems (natural, whole, integers, rationals, and irrationals).
- Operations with positive and negative numbers.
- Scientific notation.
- Estimation strategies.

1 Which of the sets below includes only rational numbers?

A $\{-3.454545\ldots, \ -\sqrt{3}, 5, 18.3\}$

B $\{-9.2, \ \pi, \ \sqrt{24}, 19.173894\}$

C $\{-7, \ \pi, \ \sqrt{16}, \ \sqrt{64}\}$

D $\{-\sqrt{36}, \ 4.25, 9.323232\ldots, 26\}$

2 Trey bought a pair of shoes that cost $84. He was charged 7.4% for sales tax. How much did Trey pay for the shoes including the sales tax?

A $6.22

B $62.16

C $90.22

D $146.16

3 Maya estimated the product below before finding its value using a calculator.

(47.8)(12.85)

Which estimate is the closest to the actual product?

A 650

B 624

C 564

D 500

Strand 2: Data Analysis, Probability, and Discrete Math

General concepts you should know:

- Graphs (histograms, line graphs, circle graphs, box-and-whisker plots, frequency charts, stem-and-leaf plots, and scatter plots).
- Measures of central tendency, variability and correlation (mean, median, mode, quartiles, and range).
- Pattern prediction.
- Probability.
- Probable outcomes of events.
- Systematic listing and counting, outcomes sets.
- Use of combinations vs. permutations.

4 Clarence will conduct a probability experiment in which he will randomly select colored marbles of identical size and shape from a bag. Clarence will use the procedures below to conduct the experiment.

- Randomly select a marble from the bag.
- Record the color of the marble in a data table.
- Replace the marble into the bag.
- Repeat the procedure 4 times.

The probability of selecting a red marble is $\frac{1}{3}$.

What is the probability that the first 4 marbles Clarence selects will be red?

A $\frac{4}{3}$

B $\frac{1}{3}$

C $\frac{1}{12}$

D $\frac{1}{81}$

5 A local movie theater is planning a "Super Hero Saturday" event. The theater will show the 6 movies listed below.

"Mr. Super"
"Beastman"
"Y-Guys"
"Arachno-Boy"
"The Enigma"
"Lady Luck"

If each movie is only shown once, in how many different ways can the movies be shown?

A 720

B 441

C 25

D 6

6 Molly discovered an error with the data in the table below. She found that during the month of March, 488 new homes were sold.

January – June
New Home to Re-Sale Home Comparison

Month	New	Re-Sale
January	305	340
February	371	324
March	288	371
April	510	413
May	521	442
June	544	490

Which of the following accurately describes the trend in the data once the error was corrected?

A The number of Re-Sale homes sold increased each month.

B The number of New homes sold increased each month.

C The number of New homes sold was always more than the number of Re-Sale homes sold.

D The number of Re-Sale homes sold was more than the number of New homes sold in January and March.

7 Aftyn and Nathan are planning to conduct a survey to find out which cafeteria food is most popular with 8th graders.

Which of the following is the least appropriate question for their survey?

A How often do you go out to eat with your family?
B How often do you eat in the school? cafeteria?
C How often do you eat the food from the fast food line?
D How often do you eat salad from the salad bar?

Strand 3: Patterns, Algebra, and Functions

General concepts you should know:

- Identify and extend patterns.
- Graphing, evaluating, simplifying, and solving linear equations and inequalities.
- Distinctions between linear and nonlinear equations and their graphs.
- The slope of a line and what it represents.

8 Tom formed a pattern that used the steps shown below:

- Start with -5 as the first term.
- Each new term is 4 more than the immediately previous term.

What are the first 4 terms of Tom's sequence?

A -5, -9, -13, -17
B -5, -1, 3, 7
C -5, -1, 2, 6
D -5, 0, 2, 6

9 Which T-chart could be generated from the rule $y = 3x - 2$?

A

x	y
-2	-4
-1	-1
0	2
1	5

B

x	y
-3	-11
-2	-8
-1	-5
0	-2

C

x	y
0	-2
1	0
2	2
3	4

D

x	y
-1	-5
0	-2
1	0
2	2

10 What is the value of the following expression when $x = 3$, $y = 1$, and $z = 5$?

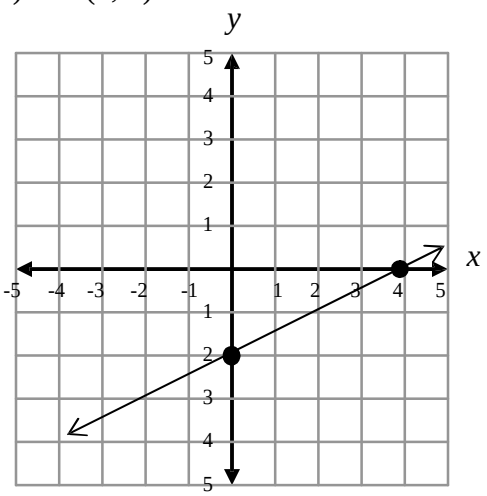
$$(3z - 2x)^2 + 2y$$

A 80
B 83
C 221
D 1521

11 Which of the following has the same solution as $x + 5 = 11$?

A $3x - 5 = 12$
B $\frac{1}{2}x + 2 = 26$
C $4x - 7 = 9$
D $2x + 3 = 15$

12 What is the slope of the line contains the points (0, -2) and (4, 0)?



A $\frac{1}{2}$

B $-\frac{1}{2}$

C 2

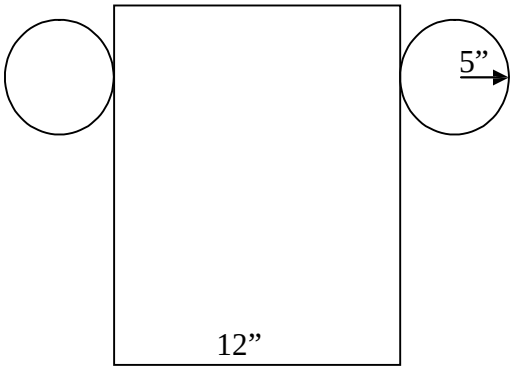
D -2

Strand 4: Geometry and Measurement

General concepts you should know:

- Pythagorean Theorem.
- Geometric relationships (parallelism, perpendicularity, congruency).
- Angle characteristics (complementary, supplementary, and congruent).
- Circle characteristics (arcs, inscribed angles, tangents, and secants).
- Identification of prisms, pyramids, cones, cylinders, and spheres.
- Coordinate plane characteristics (coordinates, distance and midpoint).
- Transformations (reflections, rotations, dilations, translations; symmetry).
- Appropriate units of measure, applications of techniques and formulas.
- Perimeter, area, volume; measuring line segments, lines, angles, 2-D and 3-D figures.

13 The net of a cylinder is shown below:



Which can be used to find the surface area of the cylinder?

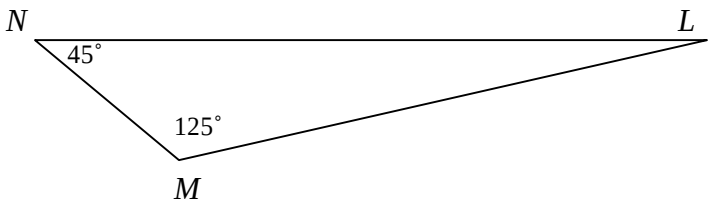
A $\pi \times 5 \times 5 \times 12$

B $2(\pi \times 10) + 12(\pi \times 5 \times 5)$

C $2(\pi \times 5 \times 5) + 12(\pi \times 10)$

D $(\pi \times 10) + 12(\pi \times 10)$

14 In $\triangle LMN$, what is the measure of $\angle L$?



A 10˚

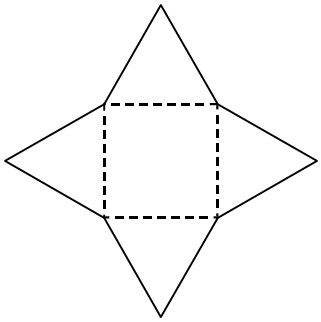
B 20˚

C 35˚

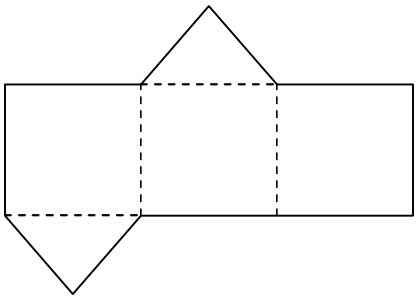
D 55˚

15 Which of the following nets could be used to make a triangular pyramid?

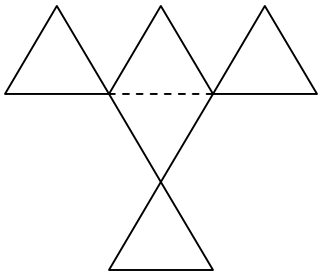
A



C



B



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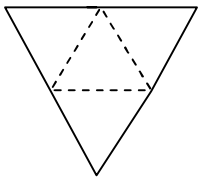
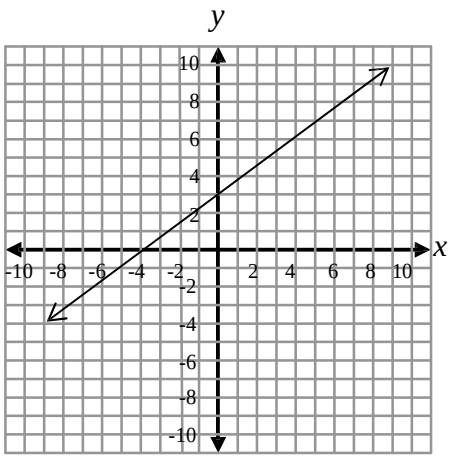


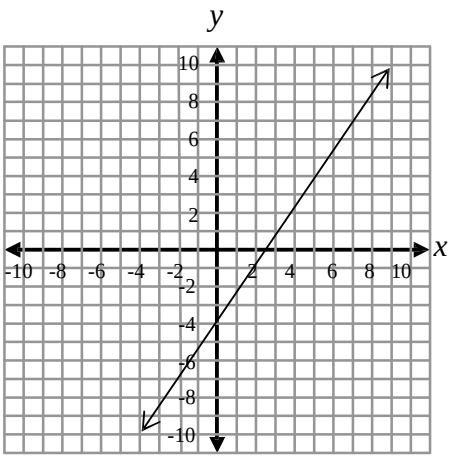
16 Which graph below best represents the values in the table below?

x	*y*
-3	1
0	-4
3	-9

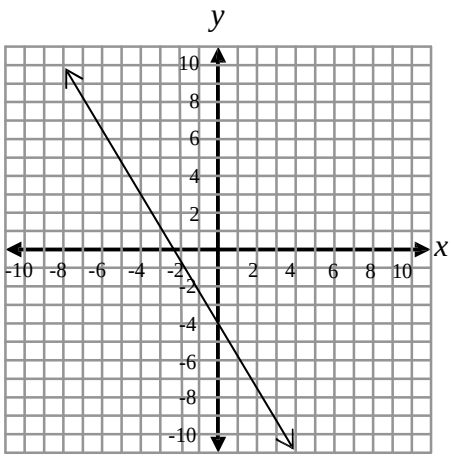
A



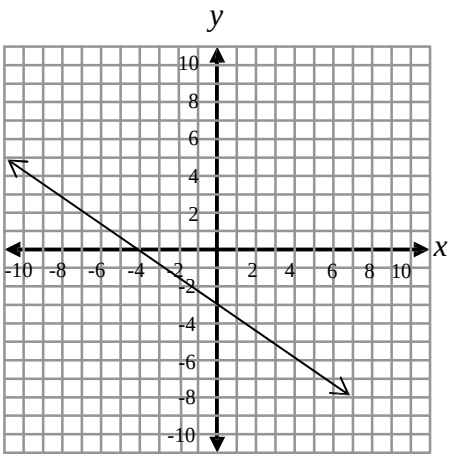
C



B



D



Strand 5: Structure and Logic

General concepts you should know:

- Inductive and deductive reasoning.
- Validity of arguments.

17 If you own a brindeel, then you own a snafule.

Using the statement above, which of the following conclusions is valid?

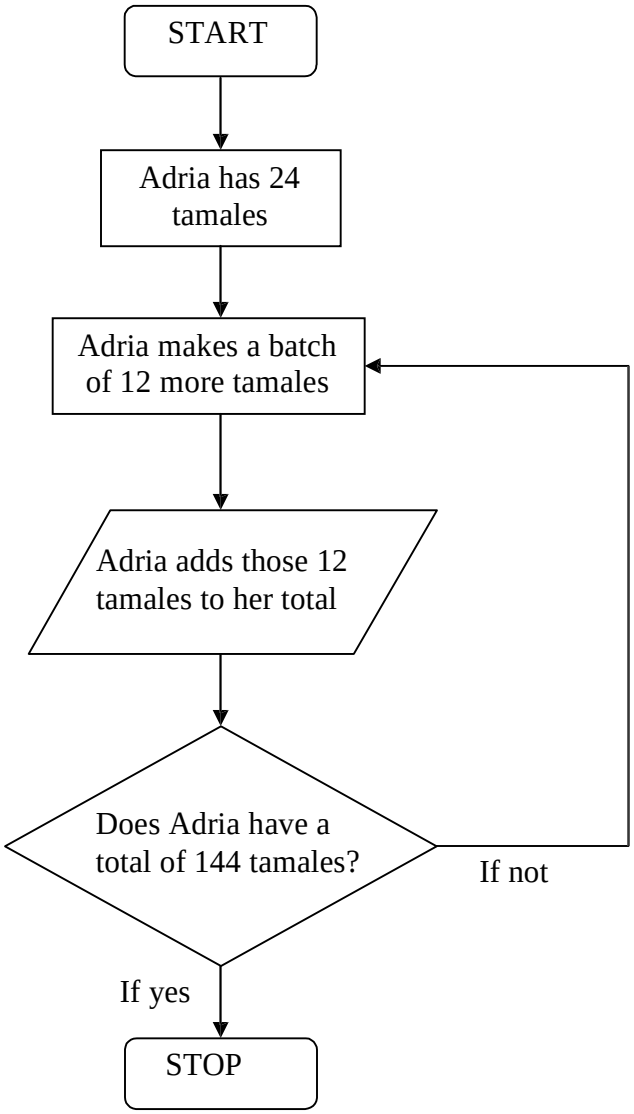
A No brindeels are snafules.

B No snafules are brindeels.

C All brindeels are snafules.

D All snafules are brindeels.

18 Adria is making tamales to sell at a school fundraiser. She has already made 24 tamales. The flow chart below shows her plan for making 144 tamales for the fundraiser.



How many batches will Adria have to make to have 144 tamales?

A 12

B 11

C 10

D 9

AIMS Reference Sheet

Use 3.14 or $\frac{22}{7}$ for π.

Plane Figures: Perimeters and Areas

Name	Notation	Circumference (C) Perimeter (P)	Area (A)
Circle	r = radius d = diameter	$C = \pi d$ or $C = 2\pi r$	$A = \pi r^2$
Parallelogram	a, b = sides h = height	$P = 2(a + b)$	$A = bh$
Rectangle	b = base h = height	$P = 2(h + b)$	$A = bh$
Trapezoid	a, b, c, d = sides b_1 = long base b_2 = short base h = height	$P = a + b + c + d$	$A = \frac{(b_1 + b_2)h}{2}$
Triangle	a, b, c = sides h = height	$P = a + b + c$	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$

Geometric Solids: Volumes and Surface Areas

Name	Notation	Volume (V)	Surface Area (SA)
Rectangular Prism	l = length w = width h = height	$V = lwh$	$SA = 2lw + 2lh + 2wh$
Rectangular Pyramid	B = area of the base h = height	$V = \frac{1}{3}Bh$ or $V = \frac{Bh}{3}$	
Right Cylinder	r = radius h = height	$V = \pi r^2 h$	$SA = 2(\pi r^2) + 2\pi rh$
Right Cone	r = radius h = height	$V = \frac{1}{3}\pi r^2 h$ or $V = \frac{\pi r^2 h}{3}$	
Sphere	r = radius	$V = \frac{4}{3}\pi r^3$	

Scoring Key

Mathematics Key

Question #1: D
Question #2: C
Question #3: B
Question #4: D
Question #5: A
Question #6: B
Question #7: A
Question #8: B
Question #9: C
Question #10: B
Question #11: D
Question #12: A
Question #13: C
Question #14: A
Question #15: D
Question #16: B
Question #17: C
Question #18: C